

## Periscope.

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### *a.*—PHYSIOLOGY OF THE NERVOUS SYSTEM.

EFFECT OF SECTION OF AUDITORY NERVE.—Bechterew's studies upon the central gray substance of the third ventricle and the olivary bodies of the medulla oblongata made it possible for him to more correctly estimate the phenomena ensuing upon section of the semicircular canals. The greater part of the experiments upon the semicircular canals were made upon pigeons, and the ensuing phenomena were carefully investigated. His results upon the canals were in accord with those of previous observers. It is known that Brown-Séquard discovered that irritation of the trunk of the auditory nerve, or its terminations in the labyrinth, through puncture by a needle, caused phenomena similar to those seen after destruction of the semicircular canals. Although these facts stand in complete accord with anatomical observations, that one part of the auditory nerve goes to the labyrinth and the other to the cochlea, yet Schiff denies the facts of Brown-Séquard. Bechterew used dogs in these experiments because they have seldom been used for the phenomenon of Flour-ens. The operation by cutting the auditory nerve in the cranial cavity must not be lightly counted upon, for in the immediate neighborhood are important parts of the brain which have an influence upon movement.

Cyon believes that the only way to cut the auditory nerve without disturbing other parts of the brain, is to enter the skull between the occipital bone and the atlas, the medulla oblongata being carefully pushed to one side. Bechterew found that it is difficult to push the medulla to one side, at least in dogs, without injuring it or wounding the posterior cerebellar crus. This operation is nearly always accompanied by a more or less flow of blood, which here is to be carefully avoided. Bechterew found the following method the best for dogs, without injuring the medulla oblongata or the cerebellum. On narcotized dogs the occipital muscles were divided, from the occipital protuberance to the mastoid process, down to the bone. An opening is made a little higher than the occipito-atloid articulation at the side, the bone here being unusually thin. After the cerebro-spinal fluid

has escaped, a stylet, bent at an angle, is introduced and gradually pushed forward to the nerve, which is divided by pressure of the instrument against the nerve. If this operation is carefully done there is not the least injury to the neighboring parts of the brain. The results were as follow : immediately after dividing the nerve there is rolling upon the large axis by the animal toward the injured side. Conjoined with this is a marked deviation of the eyes on the injured side downward and outward, on the opposite side upward and inward. In both eyes there was marked nystagmus with dilatation of the pupil on the uninjured side. The rolling of the animal is greatest in the first few days, continuing during several hours, only at times resting for a short period and lying upon the side corresponding to the injury. The head of the animal also assumes a peculiar position, the side of face on the injured side being directed downward and the other upward. The nystagmus and deviation of the eyes continue during the resting stage, although weaker than during the beginning of the movements of rotation. The extremities have a peculiar position : on the side of lesion, are drawn toward the abdomen, half flexed, and can be bent or extended in a passive manner. The extremities of the opposite side are extended outward and with such force that they are not easily flexed. This position of the extremities is not peculiar to section of the auditory nerve being found after injury of the gray substance of the third ventricle or the olivary bodies of the medulla oblongata. After a few days the rolling movements gradually decrease and occur only in the form of paroxysms, which are caused by external irritants. When the animal recovers the rolling disappears in the first week. The animal regains the power to stand on the feet, although the ocular deviation, the position of the head, and an especial disposition in great part to fall upon the side are noticed for a considerable time. In time the movements decrease, although a complete restoration of motility does not take place after several weeks. During the period of recovery an unexpected noise usually causes the animal to fall upon the side of the divided nerve, and one or two acts of rotation on the long axis take place. After section of both auditory nerves there is a general disturbance of equilibrium, an inability to go or to stand without the least weakness of the extremities being present. The animal operated on as just described lies upon the floor as he is placed. If he is painfully irritated all his movements are uncoordinated, highly irregular, and no locomotion of the body will be brought about. With these trials of movement a see-saw motion of the head ensues. When only one auditory nerve is cut and after a few days the second is divided, it was found that after the division of the second the same general disturbance of equilibrium ensued, with the deviation of the head and body. The movements about the long axis of the body are done with considerable force, so that it is nearly impossible to prevent them. After an operation on the auditory nerve, he chloroformed the dogs and found that the disposition to

roll decreased and disappeared as well as the nystagmus. The deviation of the eyes, the position of the body on the side, and the extended position of the limbs remained. Bechterew believes that all the above phenomena after section of the auditory nerve are of a reflex nature, for they take place when the cerebral hemispheres are destroyed or the animal is well narcotized. There is no doubt that the presence of uninjured cerebral hemispheres upon the phenomena after section of the auditory nerve exercises a certain influence, since the involuntary movements are excited and strengthened. The same statement is true for unilateral destruction of the olivary bodies, the central gray substance of the third ventricle, and the cerebellar crus. Only in this way can be explained that the characteristic movements of the animal operated on markedly decrease after destruction of the cerebral hemispheres, and respond only under the influences of irritations from without, whilst with uninjured hemispheres the animal himself causes the phenomena. By higher animals, as dogs, simple destruction or removal of the frontal or parietal lobe is sufficient without destruction of both hemispheres. After section of both auditory nerves there is mainly marked disturbance of the equilibrium of the body, an inability to move or stand, although there is no paralysis of the extremities.

After section of the auditory nerve or destruction of the semicircular canals, the ensuing phenomena stand in immediate dependence to the functional falling out of the canals operated on, from removal of the normal ampullar sensations which are conveyed through the cerebellum in a reflex way to the muscles, through the motor tracts, and to the normal unbroken excitation of uninjured canals which bring out certain sensations and in a reflex way convey them to the motor tracts.

The want of harmony in the sensations from the destroyed canal and the uninjured one, reaches the centres of consciousness, and causes in them a strong reaction in the form of a sense of vertigo, which on one side in a strengthened manner acts on the motor disturbances, and probably gives an important impulse to excite the involuntary motor paroxysms. This view can be extended as the origin of the motor disturbances, which ensue after injury of the three well-known organs of equilibration in relation with the peripheral organs—the semicircular canal, the central gray substance of the third ventricle, the olivary bodies of the medulla oblongata, and after injury of the cerebellum and the peduncles.

The hypothesis of Goltz, in regard to the variations of pressure of the endolymph, explains, in a satisfactory way, the functional activity of the canal as a peripheral organ, which stands in direct relation to the equilibration of the body.

The semicircular canals are organs which not only serve the equilibrium of the head but of the whole body. They stand in near functional relation to the function of the organ of hearing. The action of sound-impulse upon the movements and the state of

equilibrium of the body is performed, with all probability, by means of the semicircular canals.—*Pflüger's Archiv*, Band 30, 7 and 8 Heft.

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FUNCTION OF THE CEREBELLUM.—Prof. Schiff has a communication of a provisional nature on this subject. It is known that ablation of the most superficial layer of the cerebellum, in its whole length and breadth, or the vermis alone, causes no symptoms. This holds good not only for the gray substance, but also for the white to about the level of the second bifurcation of its fibres. If a cut is made into the portion lying between the entrance of the cerebellar peduncles of the two sides and two thirds of the thickness of cerebellum is sliced off layer by layer, then irregularities of movement ensue, which rapidly increase with the depth and extent of the wound; and when the ablation approaches the middle of the cerebellum, then ensue the movements which have been designated since Flourens as want of coördination. These disturbances of movement can ensue when an extended injury is made of one or both hemispheres without implication of the vermis, or after a lesion of the latter alone, or of a hemisphere and the vermis together. In all these instances the motor disturbances are not lasting, lessening in the course of one to two days. These motor disturbances are symptoms of the spread of traumatic irritation.

Rolling movements ensue when the middle cerebellar peduncle is injured, and the direction of the turning is toward the least injured side. If the injury reaches in the interpeduncular space to the under third of the cerebellum, or the fourth ventricle is bared, then movements of incoördination ensue, but the important point is that they remain an indefinite time. By more extended loss of substance in the under third of the cerebellum, the disturbances are greater and more extensive than by smaller losses. It is not correct to infer that the intensity and length of time of an injury of the cerebellum depend mainly upon the extent of the wound, or upon the volume of the disorganized cerebellar mass.—*Pflüger's Archiv*, Band 32, Heft 7 and 8.

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MOVEMENTS OF THE UTERUS.—Prof. Kronecker and Herr Frommel have made experiments upon this point, using the graphic method, which heretofore has not been employed. Previous observers watched the effects upon the bared organ, not discounting the injurious effect of evaporation and cooling of the uterus. Thus Frommel arranged his experiments as follows: in the vagina of a rabbit a perfusion-cannula, with a funnel-shaped end was so bound in that one of the cornua was connected with the funnel. In the upper end of this cornu of the uterus a simple glass cannula was fastened. The other one of the cornua of the uterus was ligated near the os uteri, since a want of synchrony between movements of the cornua complicates the curve. Through the glass